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United States
Department of
Agriculture

Forest Service

North Central Forest
Experiment Station



New from North Central Publications

May 1990 - November 1990

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Explanation and Instructions

"New From North Central" is a semiannual listing of recent publications resulting from the research done at the North Central Forest Experiment Station headquartered in St. Paul, Minnesota. These publications are produced to encourage and facilitate application of Forest Service research. This issue lists publications received from the printer by the North Central Station Distribution Center between May 1, 1990 and November 30, 1990.

This listing is divided into two sections. Articles in the first section can be ordered from the North Central Station Distribution Center, One Gifford Pinchot Drive, Madison, WI 53705-02398. Quantities are limited.

The second section consists of articles that appear in journals, books, or other outlets. Copies of these articles can be obtained from libraries or from the appropriate Journal.

List of Categories

Publications are listed in this brochure within the following general categories:

- Watershed Management
- Wildlife Habitat
- Urban Forestry and Community Forestry
- Insect Biology
- Insect Control and Management Strategies
- Disease Detection and Evaluation
- Disease Biology
- Disease Control and Management Strategies
- Timber Management
- Forest Biology
- Silviculture and Management
- Growth and Yield
- Genetics and Tree Improvement
- Forest Inventory and Analysis
- Forest Economics
- Forest Engineering Systems
- Utilization and Processing of Wood
- General

SECTION 1.—Available from the North Central Station Distribution Center.

Watershed Management

1. Spatial and temporal patterns of sulfur and nitrogen in wood of trees across the north central United States.

Ohmann, L.F.; Grigal, D.F. 1990. Canadian Journal of Forest Research. 20(5): 508-513.

Reports the results of a study of spatial and temporal patterns of sulfur and nitrogen in Minnesota, Wisconsin, and Michigan forests.

2. Influence of flooding duration on the biomass growth of alder and willow.

Ohmann, Lewis F.; Knighton, M. Dean; McRoberts, Ronald. 1990. Res. Pap. NC-292. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 5 p.

Simple second-order (quadratic) polynomials were used to model the relationship between 3-year biomass increase (net oven-dry weight in grams) and flooding duration (days) for four combinations of shrub type (alder, willow) and soil type (fine-sand, clay-loam).

Wildlife Habitat

3. Bird densities and diversity in clearcut and mature oak-hickory forest.

Thompson, Frank R., III; Fritzell, Erik, K. 1990. Res. Pap. NC-293. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 7 p.

Describes nongame bird densities and diversity in a central Missouri oak-hickory forest 1 year before and 3 years after portions were clearcut. Discusses changes in species density and diversity and their management implications.

Insect Biology

4. Seasonal flight patterns of Hemiptera (excluding Miridae) in a southern Illinois black walnut plantation.

McPherson, J.E.; Weber, B.C. 1990. The Great Lakes Entomologist. 23(2): 105-120.

Reports on the seasonal flight patterns of 99 species and subspecies of Hemiptera captured in window traps during 1979-1980 in an Illinois black walnut plantation. Discusses 10 taxa in detail.

Disease Detection and Evaluation

5. How to identify and control noninfectious diseases of trees.

Mielke, Manfred E.; Ostry, Michael E. 1990. HT-26. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 16 p. Revised.

Describes and illustrates tree diseases caused by non-living agents. Control strategies to minimize or prevent injury are included.

6. Pocket guide to red pine diseases and their management.

Nicholls, Thomas H.; Skilling, Darroll D. 1990. Misc. Publ. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 41 p.

Provides forest managers and pest control specialists with management strategies and technical references for the most important diseases of red pine. Also describes the common disease problems of red pine.

7. How to identify and control *Meria laricis* and *Mycosphaerella laricina* needlecast diseases of larch.

Ostry, M.E.; Cummings Carlson, J.E. 1990. HT-68. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 8 p.

Two needlecast diseases caused by the fungi *Meria laricis* and *Mycosphaerella laricina* result in yellowing and premature needle loss of larch in North America.

Timber Management

8. Aspen symposium '89, proceedings.

USDA Forest Service. 1990. Adams, Roy D., ed; 1989 July 25-27; Duluth, MN. Gen. Tech. Rep. NC-140. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 348 p.

This proceedings of Aspen Symposium '89 contains 31 papers balanced between the subjects of aspen ecology and silvics, aspen management and silviculture, and aspen products and utilization. It also includes eight brief papers based on poster presentations.

Silviculture and Management

9. The microcomputer scientific software series #6: the ECOPHYS user's manual.

Host, George E.; Rauscher, H. Michael; Isebrands, J.G.; Dickmann, Donald I.; Dickson, Richard E.; Crow, Thomas R.; Michael, D.A. 1990. Gen. Tech. Rep. NC-141. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 50 p.

ECOPHYS is an ecophysiological whole-tree growth process model designed to simulate the growth of poplar in the establishment year. This microcomputer-based model may be used to test the influence of genetically determined physiological or morphological attributes on plant growth. This manual describes the installation, file structures, and operational procedures for using the model.

10. Regeneration silviculture of birch: a review.

Perala, Donald A.; Alm, Alvin A. 1990. Forest Ecology and Management. 32(1): 39-77.

An overall review of the regeneration silviculture of birch, including an extensive bibliography.

11. Reproductive ecology of birch: a review.

Perala, Donald A.; Alm, Alvin A. 1990. Forest Ecology and Management. 32(1): 1-38.

An overall review of the reproductive ecology of birch, including an extensive bibliography.

Growth and Yield

12. Test of the TRIM Inventory projection methods on Wisconsin jack pine.

Leary, Rolfe A.; Smith, W. Brad. 1990. Canadian Journal of Forest Research. 20(6): 774-780.

Evaluates combinations of three volume-age relations (the density standards) and three relative density change equations using 165 jack pine remeasurement plots. The yield table of Gevorkiantz and Duerr (1938) and a Riccati equation-based density change function performed best, estimating 5-year growth to within 1.4 percent.

13. Yield of a 46-year-old tamarack plantation.

Rauscher, H. Michael; Barse, Robert G. 1990. Res. Note NC-351. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 2 p.

Reports on the survival and growth of a 46-year-old tamarack plantation on an upland site.

Forest Inventory and Analysis

14. Pulpwood production in the Lake States, 1989.

Hackett, Ronald L. 1990. Res. Note NC-352. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 4 p.

Lake States pulpwood production climbed to a record 8.54 million cords in 1989. Pulpwood production is shown by county and species group in Michigan, Minnesota, and Wisconsin.

15. Missouri timber industry—an assessment of timber product output and use.

Smith, W. Brad; Jones, Shelby. 1990. Resour. Bull. NC-120. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 51 p.

Discusses recent Missouri forest industry trends; production and receipts of saw logs; and production of charcoal, veneer logs, cooperage logs, and other products in 1987. Reports on logging residue, on wood and bark residue generated at primary wood-using mills, and on disposition of this residue.

16. Indiana's timber resource, 1986: an analysis.

Spencer, John S., Jr.; Kingsley, Neal P.; Mayer, Robert W. 1990. Resour. Bull. NC-113. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 85 p.

The third inventory of Indiana's timber resource shows that area of timberland increased from 3.9 to 4.3 million acres between 1967 and 1986, and growing-stock volume gained from 3.7 to 5.2 billion cubic feet. Presented are analysis and statistics on forest area and timber volume, growth, mortality, removals, and projections.

General

17. New from North Central.

USDA, Forest Service. 1990. Misc. Publ. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 13 p.

Contains an annotated list of publications available from the North Central Station Distribution Center that were published from December 1989 through April 1990. Also contains a list of publications that may be available from local college and forestry libraries.

SECTION 2.—The following is a list of our articles that appear in various Journals, etc. We do NOT have any in stock at this time. You may check with your local college or forestry library or appropriate Journal for a copy of the article.

Watershed Management

Hydraulic characteristics of four peatlands in Minnesota.

Gafni, Abraham; Brooks, Kenneth N. 1990. Canadian Journal of Soil Science. 70(2): 239-253.

Relations between forest conditions and atmospheric deposition along the northwestern Minnesota-to-southeastern Michigan deposition gradient.

Ohmann, Lewis E.; Shifley, Stephen R. 1989. In: Noble, Reginald D.; Martin, Juri L.; Jensen, Keith F., eds. Air pollution effects on vegetation, including forest ecosystems; 1988 September 13-25; Corvallis, OR. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 225-232.

The acid-base balance of peatlands: a short-term perspective.

Urban, N.R.; Bayley, S.E. 1986. Water, Air, and Soil Pollution. 30: 791-800.

The relative importance of denitrification and nitrate assimilation in midcontinental bogs.

Urban, N.R.; Eisenreich, S.J.; Bayley, S.E. 1988. Limnology and Oceanography. 33(6): Part 2: 1611-1617.

Precipitation: process and analysis.

Verry, Elon S. 1990. Ecology. 71(1): 415-416. Book review.

Selection and management of shallow water impoundments for wildlife.

Verry, Elon S. 1989. In: Sharitz, Rebecca R.; Gibbons, J. Whitfield, eds. Freshwater wetlands and wildlife: Proceedings of a symposium; 1986 March 24-27; Charleston, SC. DOE Symp. Ser. 61. Oak Ridge, TN: U.S. Department of Energy, Office of Scientific and Technical Information: 1177-1194.

Wildlife Habitat

Population viability and the Kirtland's warbler.

Baker, Richard J. [1989]. In: At the crossroads-extinction or survival: Proceedings, Kirtland's warbler symposium; 1989 February 9-11; Lansing, MI. [Cadillac, MI]: [Huron-Manistee National Forests]: 12-27.

Silvicultural prescription advisors for deer and grouse: an application of expert systems.

Buech, Richard R.; Martin, Christian J.; Rauscher, H. Michael. 1990. Canada Committee on Ecological Land Classification Wildlife Working Group Newsletter 10: 10-11. Abstract.

Multi-resource values of Kirtland's warbler habitat.

Probst, John R.; Ennis, Kenneth Rex. [1989]. In: At the crossroads-extinction or survival: Proceedings, Kirtland's warbler symposium; 1989 February 9-11; Lansing, MI. [Cadillac, MI]: [Huron-Manistee National Forests]: 69.

Predicting Kirtland's warbler populations by habitat conditions.

Probst, John R.; Weinrich, Jerry. [1989]. In: At the crossroads-extinction or survival: Proceedings, Kirtland's warbler symposium; 1989 February 9-11; Lansing, MI. [Cadillac, MI]: [Huron-Manistee National Forests]: 61-62.

Urban and Community Forestry

Wildland management near large urban centers: the need for diversity.

Dwyer, John F. [1990]. In: Lime, David W., ed. Managing America's enduring wilderness resource: Proceedings of the conference; 1989 September 11-17; Minneapolis, MN. St. Paul, MN: University of Minnesota, Tourism Center, Minnesota Extension Service and Minnesota Agricultural Experiment Station: 318-324.

Outdoor recreation participation and preferences by black and white Chicago households.

Dwyer, John F.; Hutchison, Ray. [1990]. In: Vining, Joanne, ed. Social science and natural resource recreation management. Social behavior and natural resources series. Boulder, CO: Westview Press: 49-67.

Trail planning and management: user information is useful information.

Gobster, Paul H.; Dwyer, John F.; Schroeder, Herbert W. [1990]. In: Gaby, Ewin D., ed. 9th National trails symposium proceedings; 1988 September 11-14; [Helen, GA]. Lafayette, IN: [Tennessee Valley Authority]: 67-71.

Stated preference and choice models applied to recreation research: a review.

Louviere, Jordan; Timmermans, Harry. 1990. Leisure Sciences. 12: 9-32.

An ecological approach to recreation in natural resource settings.

Schroeder, Herbert W. [1990]. In: Vining, Joanne, ed. Social science and natural resource recreation management. Social behavior and natural resources series. Boulder, CO: Westview Press: 3-12.

The effect of the experience use history on the multidimensional structure of motivations to participate in leisure activities.

Williams, Daniel R.; Schreyer, Richard; Knopf, Richard C. 1990. Journal of Leisure Research. 22(1): 36-54.

Insect Biology

An artificial diet for cottonwood and imported willow leaf beetles (Coleoptera: Chrysomelidae) and comparative performance on poplar foliage.

Bauer, Leah S.; Meerschaert, Joann; Forrester, O. Thomas. 1990. Journal of Entomological Science. 25(3): 475-480.

Acoustic emissions from drought-stressed trees: Implications for forest insects.

Haack, Robert A. 1990. In: Proceedings, 7th International nondestructive testing of wood symposium; 1989 September 27-29; Madison, WI. [Pullman, WA]: Conferences and Institutes, Washington State University: 279. Abstract.

Phenological variation in the susceptibility of white spruce to the spruce budworm.

Lawrence, Robert Kent. 1990. East Lansing, MI: Michigan State University. 115 p. (Ph.D. Dissertation.)

Pollution induced changes in forest-insect relationships.

Mattson, William J.; Witter, John A. 1990. In: Proceedings, International Union of Forest Research Organizations, 19th World Congress, division 2; 1990 August 5-11; Montreal, Canada. [Montreal, Canada]: Canadian IUFRO World Congress Organizing Committee: 152-163.

The plant-feeding gall midges of North America.

Wilson, Louis F. 1990. The Great Lakes Entomologist. 23(1): 38. Book review.

Insect Control and Management Strategies

Response of the cottonwood leaf beetle (Coleoptera: Chrysomelidae) to *Bacillus thuringiensis* var. *san diego*.

Bauer, Leah S. 1990. Environmental Entomology. 19(2): 428-431.

An improved Saratoga spittlebug nymphal appraisal survey.

Wilson, Louis F. 1990. Northern Journal of Applied Forestry. 7: 83-86.

Disease Detection and Evaluation

International transfer of *Alnus*, *Populus*, and *Salix* germplasm: early test results.

Ager, Alan; Nordh, Nils Erik; Ledin, Stig; Ostry, Michael; Carlson, Michael; Ronnberg-Wastljung, Ann Christin. 1990. Biomass. 22: 49-62.

Use of aminopeptidase substrate specificities to identify species of *Cylindrocladium* in Wisconsin nurseries.

Stevens, C.; Palmer, M.A.; Tang, A.Y.; McRoberts, R.E. 1990. Mycologia. 82(4): 436-443.

Disease Biology

Disease resistance in a wild system: hypoxylon canker of aspen.

Ostry, Michael E.; Anderson, Neil A. 1990. In: Adams, Roy D., ed. Aspen symposium '89, Proceedings of a symposium; 1989 July 25-27; Duluth, MN. Gen. Tech. Rep. NC-140. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 237-241.

Disease Control and Management Strategies

Clonal micropropagation of mature *Larix*.

Diner, Alex M. 1990. New Forests. 4: 63-66.

A canker disease of autumn olive caused by *Tubercularia vulgaris*.

Kessler, K.J., Jr. 1990. European Journal of Forest Pathology. 20: 148-153.

Destruction of *Gnomonia leptostyla* perithecia on *Juglans nigra* leaves by microarthropods associated with *Elaeagnus umbellata* litter.

Kessler, Kenneth J., Jr. 1990. Mycologia. 82(3): 387-390.

Minimizing disease injury to hybrid poplars.

Ostry, Michael E.; McNabb, Harold S., Jr. 1990. Journal of Environmental Horticulture. 8(2): 96-98.

Developing tissue culture systems for increasing the disease resistance of aspen.

Ostry, M.; Bucciarelli, B.; Sain, S.; Hackett, W.P.; Anderson, N.A. 1990. In: Adams, Roy D., ed. Aspen symposium '89, Proceedings of a symposium; 1989 July 25-27; Duluth, MN. Gen. Tech. Rep. NC-140. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 315-318.

Rooting of American chestnut microcuttings.

Serres, Rod; Read, Paul; Hackett, Wesley; Nissen, Per. 1990. Journal of Environmental Horticulture. 8(2): 86-88.

Use of somaclonal variation techniques to produce rust resistant white pine.

Skilling, Darroll D.; Ostry, Michael E.; Pijut, Paula M. 1990. In: Burley, J., div. coord. Proceedings, International Union of Forest Research Organizations, 19th IUFRO World Congress, division 2; 1990 August 5-11; Montreal, CA. [Montreal, CA]: Canadian IUFRO World Congress Organizing Committee: 141-145.

Forest Biology

Crown architecture in relation to productivity of *Populus* clones in the Pacific Northwest, U.S.A.

Ceulemans, R.; Hinckley, T.M.; Heilman, P.E.; Isebrands, J.G.; Stettler, R.F. 1989. In: Dreyer, E., et al., eds. Forest tree physiology: Proceedings of the international symposium; 1988 September 25-30; Nancy, FR. Annales des Sciences Forestieres. 46 Suppl.: 199s-201s.

Biological diversity and forest planning.

Crow, Thomas R. [1990]. In: Brockway, Dale G., ed. Building a forest resource constituency: Proceedings of the Northeastern Forest Resource Planners Association 11th annual conference; 1989 June 4-7; Grand Rapids, MI. [East Lansing, MI]: Northeastern Forest Resource Planners Association: 78-81.

Changes in carbon fixation, partitioning, and allocation during episodic growth in northern red oak seedlings.

Dickson, Richard E.; Tomlinson, Patricia T. 1990. In: Van Sambeek, J.W.; Larson, M.M., eds. 4th Workshop on seedling physiology and growth problems in oak plantings; 1989 March 1-2; Columbus, OH. Gen. Tech. Rep. NC-139. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 4. Abstract.

Northern red oak growth and carbon allocation in different environments.

Dickson, Richard E.; Tomlinson, Patricia T. 1990. In: Program and abstracts: 75th annual ESA meeting; 1990 July 29-August 2; Snowbird, UT. Supplement to the Bulletin of the Ecological Society of America. 71(2): 138. Abstract.

Genetic variation of taxonomic traits of the northern red oak complex on the Apostle Islands.

Hokanson, Stan C.; Isebrands, J.G.; Hancock, James F. 1989. In: Brander, Robert B.; Ludwig, Margaret D., eds. Proceedings of the 11th Research conference; 1989 November 1-2; Bayfield, WI. Omaha, NE: U.S. Department of the Interior, National Park Service, Midwest Regional Office, Research and Science Division: 8.

Vegetative propagation of northern red oak: an update.

Isebrands, J.G.; Teclaw, R.M. 1990. In: Van Sambeek, J.W.; Larson, M.M., eds. 4th Workshop on seedling physiology and growth problems in oak plantings; 1989 March 1-2; Columbus, OH. Gen. Tech. Rep. NC-139. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 9. Abstract.

Undercutting influences root morphology and field performance of northern red oak.

Johnson, Paul S. 1990. In: 4th Workshop on seedling physiology and growth problems in oak plantings: Abstracts; 1989 March 1-2; Columbus, OH. Gen. Tech. Rep. NC-139. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 12. Abstract.

Photosynthesis patterns during the establishment year within two *Populus* clones with contrasting morphology and phenology.

Michael, D.A.; Dickmann, D.I.; Isebrands, J.G.; Nelson, N.D. 1990. Tree Physiology. 6: 11-27.

Effects of pre-sowing radicle clipping on oak seedling root development.

Ponder, Felix, Jr.; Cecich, Robert A. 1990. In: Bongarten, Bruce C.; Dougherty, Philip M.; Teskey, Robert O., comps. Program and abstracts from the 11th North American forest biology workshop; 1990 June 13-15; Athens, GA. [Place of publication unknown]: [Publisher unknown]: 89. Abstract.

Dynamics of light interception, leaf area and biomass production in *Populus* clones in the establishment year.

Scarascia-Mugnozza, G.E.; Isebrands, J.G.; Hinckley, T.M.; Stettler, R.F. 1989. In: Dreyer, E., et al., eds. Forest tree physiology: Proceedings of the international symposium; 1988 September 25-30; Nancy, FR. Annales des Sciences Forestieres. 46 Suppl.: 515s-518s.

Cotyledon contribution to northern red oak seedling.

Tomlinson, P.T.; Dickson, R.E.; Gust, K.M. 1990. Supplement to Plant Physiology. 93(1): 121. Abstract 708.

Selection of hybrid poplar clones under varying moisture regimes: preliminary results.

Walsh, T.A.; Burk, T.E.; Isebrands, J.G. 1990. In: Adams, Roy D., ed. Aspen symposium '89: Proceedings of a symposium; 1989 July 25-27; Duluth, MN. Gen. Tech. Rep. NC-140. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 323-330.

Silviculture and Management

Ecosystem carbon following aspen harvesting in the upper Great Lakes.

Alban, David H.; Perala, Donald A. 1990. In: Adams, Roy D., ed. Aspen symposium '89: Proceedings of symposium; 1989 July 25-27; Duluth, MN. Gen. Tech. Rep. NC-140. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 123-131.

Impact of aspen timber harvesting on soils.

Alban, David H.; Perala, Donald A. 1990. In: Gessel, S.P.; Lacate, D.S.; Weetman, G.F.; Powers, R.F., eds. Sustained productivity of forest soils: 7th North American forest soils conference; [1988 July 24-28]; Vancouver, BC. Vancouver, BC: University of British Columbia: 377-391.

Models for estimating DBH from stump diameter for southern Indiana oaks.

Johnson, Paul S.; Weigel, Dale R. 1990. Northern Journal of Applied Forestry. 7(2): 79-81.

Sustaining site productivity in North American forests: problems and prospects.

Powers, R.F.; Alban, D.H.; Miller, R.E.; *et al.* 1990. In: Gessel, S.P.; Lacate, D.S.; Weetman, G.F.; Powers, R.F., eds. Sustained productivity of forest soils: 7th North American forest soils conference; [1988 July 24-28]; Vancouver, BC. Vancouver, BC: University of British Columbia: 49-79.

Overview of artificial intelligence applications in natural resource management.

Rauscher, H. Michael; Hacker, Robert. 1989. Heuristics: The Journal of Knowledge Engineering. 2(3): 30-42. (Also printed in: Burkhart, Harold E.; Rauscher, H. Michael; Johann, Klaus, eds. Artificial intelligence and growth models for forest management decisions; 1989 September 18-22; Vienna, Austria. FWS-1-89. Blacksburg, VA: Virginia Polytechnic Institute and State University, School of Forestry and Wildlife Resources: 202-222.)

Hypertext and AI: a complementary combination for knowledge management.

Rauscher, H. Michael; Host, George E. 1990. AI Applications in Natural Resource Management. 4(3): 58-61.

Using expert systems to model tree development.

Rauscher, H. Michael; Isebrands, J.G. 1990. In: Wensel, Lee C.; Biging, Greg S., tech. eds. Forest simulation systems: Proceedings of the IUFRO conference; 1988 November 2-5; Berkeley, CA. Bull. 1927. [Berkeley, CA]: [University of California, Division of Agriculture and Natural Resources]: 129-138.

A red pine forest management advisory system: knowledge model and implementation.

Rauscher, H. Michael; Benzie, John W.; Alm, Alvin M. 1990. AI Applications in Natural Resource Management. 4(3): 27-43.

An aspen forest management advisory system.

Rauscher, H.M.; Perala, D.A.; Host, G.E. 1990. In: Adams, Roy D., ed. Aspen symposium '89: Proceedings of a symposium; 1989 July 25-27; Duluth, MN. Gen. Tech. Rep. NC-140. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 185-194.

Growth and Yield

Analysis and modeling of patterns of forest ingrowth in the north central United States.

Shifley, Stephen Richard. 1990. St. Paul, MN: University of Minnesota. 168 p. (Ph.D. thesis)

Genetics and Tree Improvement

Early flowering jack pine selections flower in a controlled environment.

Bolstad, Sheryl B.; Kang, H.; Cecich, R.A. 1990. In: Bongarten, Bruce C.; Dougherty, Philip M.; Teskey, Robert O., comps. Programs and abstracts from the 11th North American forest biology workshop; 1990 June 13-15; Athens, GA. [Place of publication unknown]: [Publisher unknown]: 71. Abstract.

Gibberellin A₁₇ enhances flowering of *Picea glauca* grafts in two consecutive years.

Cecich, R.A.; Riemenschneider, D.E. 1989. In: Dreyer, E., *et al.*, eds. Forest tree physiology: Proceedings of the international symposium; 1988 September 25-30; Nancy, FR. Annales des Sciences Forestieres. 46 Suppl.: 37s-39s.

ATP concentrations in *Pinus banksiana* cuttings during adventitious rooting.

Haissig, Bruce E. 1990. Journal of Plant Physiology. 136: 499-502.

Reduced irradiance and applied auxin influence carbohydrate relations in *Pinus banksiana* cuttings during propagation.

Haissig, Bruce E. 1990. Physiologia Plantarum. 78: 455-461.

Whole-tree growth process models based on structural-functional relationships.

Isebrands, J.G.; Rauscher, H. Michael; Crow, Thomas R.; Dickmann, Donald I. 1990. In: Dixon, Robert K.; Meldahl, Ralph S.; Ruark, Gregory A.; Warren, William G., eds. Process modeling of forest growth responses to environmental stress. Portland, OR: Timber Press: 96-112.

Population genetics theory in managing naturally regenerated forests.

Kang, Hyun. 1989. In: Demeritt, Maurice E., ed. Proceedings of the 31st Northeastern forest tree improvement conference and the 6th North Central Tree Improvement Association; 1988 July 7-8; University Park, PA. [University Park, PA]: [Pennsylvania State University]: 48-62.

Biochemical mechanism of herbicide tolerance of *in vitro* selected *Populus*.

Michler, C.H.; Bauer, E.O. 1990. In: 41st Annual meeting of the Tissue Culture Association; 1990 June 10-13; Houston, TX. In Vitro Cellular & Developmental Biology. 26(3): Part 2: 47A. Abstract 126.

Incorporating tree improvement in natural regeneration.

Murphy, J.D.; Kang, H. 1989. In: Demeritt, Maurice, E., ed. Proceedings of the 31st Northeastern forest tree improvement conference and the 6th North Central Tree Improvement Association; 1988 July 7-8; University Park, PA. [University Park, PA]: [Pennsylvania State University]: 201-205.

Forest Inventory and Analysis

Old soldiers fading away.

Spencer, John, Jr.; Mayer, Robert. 1990. Outdoor Indiana. 55(6): 20-23.

The Lake States' aspen resource revisited: mid-1960s-1987.

Spencer, John S., Jr.; Leatherberry, Earl C.; Kingsley, Neal P. 1990. In: Adams, Roy D., ed. Aspen symposium '89: Proceedings of a symposium; 1989 July 25-27; Duluth, MN. Gen. Tech. Rep. NC-140. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 243-252.

Pulpwood production in 1988: increases continue in the northern states.

Widmann, Richard H.; Blyth, James E. 1990. The Northern Logger and Timber Processor. 38(8): 24-25.

Forest Economics

A price index for deflating State Agricultural Experiment Station research expenditures.

Bengston, David N. 1989. The Journal of Agricultural Economics Research. 41(4): 12-20.

Exogenous factors affecting research institutions in developing countries.

Bengston, David N. 1989. International Journal of Technology Management. 4(3): 317-331.

Impact evaluation and planning of research programs.

Bengston, David N. 1989. In: Ellefson, Paul V., ed. Forest resource economics and policy research: strategic directions for the future. Boulder, CO: Westview Press: 41-59.

Research priority implications of forecasting regional timber harvest and transport technologies.

Bradley, Dennis P. [1989]. In: Proceedings, 23d annual Pacific Northwest regional economic conference; 1989 April 27-29; Corvallis, OR. [Corvallis, OR]: The Pacific Northwest Regional Economic Conference and the Northwest Policy Center, University of Washington: 71-80.

What can economics say about sustainability and biodiversity?

Bradley, Dennis P.; Lothner, David C. 1989. In: Mitchell, C.P.; Sennerby-Forsse, L.; Zsuffa, L., eds. Multipurpose tree production systems: Proceedings, Joint IUFRO P1.09-00 and International Poplar Commission, FAO, Ad-hoc Committee on Biomass Production Systems workshop; 1988 September 5-7; Beijing, China. Rapport 46. Uppsala, Sweden: Swedish University of Agricultural Sciences, Department of Ecology and Environmental Research: 160-169.

Planning and managing forestry research: guidelines for managers.

Gregersen, Hans M.; Lundgren, Allen L.; Bengston, David N. 1990. FAO For. Pap. 96. Rome, Italy: Food and Agriculture Organization of the United Nations. 181 p.

Nonindustrial private forest management in the South: assistance foresters' activities and perceptions.

Hodges, Donald G.; Cubbage, Frederick W. 1990. Southern Journal of Applied Forestry. 14(1): 44-48.

Emerging issues in forest management and use.

Jakes, Pamela; Gregersen, Hans; Lundgren, Allen; Bengston, David. 1990. Journal of Forestry. 88(4): 25-28, 34.

Using forest sector models to estimate the potential impact of current wood utilization research.

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